United States Department of the Interior
Fish and Wildlife Service

Fishery Leaflet 47

Chicago 54, Ill. * January 1944

[Reprinted from *The Geographical Review*, Vol. XXX, No. 2, April, 1940.]

FISHERIES OF NORTH AMERICA

WITH SPECIAL REFERENCE TO THE UNITED STATES*

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WITH an annual yield of about 6.6 billion pounds of aquatic products, the commercial fisheries of North America are among the most productive in the world. Not only are they highly productive at the present time, but in some areas they have flourished for more than four centuries—the great cod fishery of the western North Atlantic, for example, which began shortly after Cabot carried back to the Old World glowing accounts of the great abundance of fish in these waters. A historical report prepared by Thomas Jefferson[1] when he was secretary of state mentions that by 1577 some 315 vessels from the Old World were prosecuting the cod fishery in the western North Atlantic—150 from France, 100 from Spain, 50 from Portugal, and 15 from England.

Atlantic Fisheries

During the early years of the fishery it was conducted fairly close to shore. The catch was landed fresh at temporary shore camps, where it was salted and dried. Later, permanent salting and fishing stations were established by the French and the English along the North Atlantic coast of the New World near the fishing grounds. These stations permitted more extensive exploitation. Larger vessels were constructed, and their range was extended. It then became apparent that the most productive fishing grounds, or "banks," were at a long distance from shore. Voyages took more time, and it became a problem to land the catch while still fresh. To overcome the difficulty, the fish were "green" salted aboard the vessels immediately after capture.

This transfer of a processing function from shore to vessel, which occurred about the latter part of the seventeenth century, constituted the beginning of what we now call the "factory" ship. By this innovation vessels were enabled to fish a wider area and to remain at sea either for a longer period or until they obtained a pay load. The load of green-salted fish was carried to the shore station, further processed, and prepared for export. It is interesting to note that fish was the first export item from the New World. Furthermore, it

*Much of the material contained in this article has been drawn from "The Factory Ship," by R. H. Fiedler, presented at the Sixth Pacific Science Congress, held in the San Francisco Bay region from July 24 to August 12, 1939.

[1] Report of Honorable Thomas Jefferson, Secretary of State, on the Subject of the Cod and Whale Fisheries Made to the House of Representatives February 1, 1791, *42nd Congr., 2nd Sess., House Misc. Doc. No. 32*, 1872, pp. 1–11.

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bulked large among the exports for many years. After the Revolution, fish, along with whale oil, was one of the principal exports of the United States; and this is one reason why the merchant marine of New England became so important in the early days of our independence.

For about two centuries after Cabot's explorations the cod fishery of the western North Atlantic continued to be prosecuted by vessels from England, France, Portugal, and Spain and from English and French colonies in America. Then vessels from Portugal and Spain withdrew. For the next century English and French vessels, both from the Old World and from the colonies, shared the fishery alone.

During this period there were many disputes between England and France over the fishing rights. These led to bloodshed and, with other causes, to the French and Indian War, which finally ended in the withdrawal of France from the northern part of America, except for the islands of St. Pierre and Miquelon. Along with the cession of territory, France also relinquished many of her fishing rights in this area, except that she continued to prosecute the cod fishery on the Grand Banks off Newfoundland, basing her operations on St. Pierre. England's fishery passed into the hands of Canada, Newfoundland, and the United States. Incidentally, it may be noted that under Article I of the treaty of October 20, 1818, between Great Britain and the United States our fishermen still have the right to take fish of every kind on the west and southwest coasts of Newfoundland, the southern part of Labrador and Quebec, and the coasts of the Magdalen Islands. By this same treaty they also have the right to dry and cure fish in the unsettled bays, harbors, and creeks on the southwest coast of Newfoundland and the southern part of the coast of Labrador and Quebec.

Portugal reëntered the cod fishery on the Grand Banks in 1885 and has continued operations there to the present time. In some recent years before the Spanish civil war, vessels from Spain also conducted intermittent cod-fishing operations on the Grand Banks. In 1938, and again in 1939, Italy sent a few vessels to the Banks; their operations were conducted from St. Pierre.

Thus vessels from six countries are now prosecuting the cod fishery in the western North Atlantic. After continuous exploitation for more than four hundred years this fishery is still the basis of a great food industry, yielding more than a billion pounds annually. In recent years the catch was distributed about as follows: Newfoundland, 513 million pounds; France, 228; Canada, 191; the United States, 122; Portugal, 56; and Italy, 4.

Concurrently with the growth and development of the cod fishery other fisheries along the Atlantic coast of North America came in for attention. At first these also were prosecuted in waters close to the home port; then, as demand for fish increased and methods of

capture improved, they were extended to cover the ranges of the various species along the North American continent. Such anadromous fishes as salmon, shad, and alewives, available for capture in the mouths of rivers and bays during the spawning periods, were sought in other localities along the entire Atlantic seaboard. Similarly, fisheries for various inshore species, such as spot, squeteague, croaker, mullet, and shrimp, were extended along the coast where these fishes were available for capture. In the deeper waters offshore, demersal, or bottom, fish, such as hake, cusk, flounder, haddock, and halibut, were sought on the 70,000 square miles of fishing banks between Cape Cod and the east edge of Newfoundland. Pelagic, or surface-swimming, fish, too, were followed over their entire range along our Atlantic seaboard. The mackerel fishery, for instance, begun in New England, was early extended south to New Jersey and north to the Gulf of St. Lawrence and southern Newfoundland. The fishery for red snappers and groupers was extended from inshore waters along the Gulf coast to banks far from the home port: most of the catch is now taken on the Campeche Banks in the Gulf of Mexico off Yucatan. The winter habitat of various species of fish formerly caught in the inshore waters along the Middle Atlantic coast during the summer has been located and is now the basis for a trawl fishery during the winter, concentrated off the Virginia capes and North Carolina.

In general, the most important fisheries along the Atlantic coast of North America north of Cape Cod are on the offshore banks; south of this cape the most important fisheries are inshore. Figure 3 (pp. 206–207) shows the approximate location of the principal United State fisheries (see also the table on p. 213).

Pacific and Interior Fisheries

Exploitation of the fishery resources on the Pacific coast of North America, after the arrival of the white man about a century ago, pursued a course similar to that followed along the Atlantic coast. The first commercial fishing efforts were directed toward the capture of fish in the rivers and bays near the settlements. Salmon was the principal fish sought; and it was not long before a fishery was in operation in all the rivers and bays frequented by salmon from California to Bering Sea. Halibut was first taken close to shore; later the fishery was extended to more distant banks along the coast, as far north and west as the Aleutian Islands.

The Pacific tuna fishery, which was formerly conducted only off the California coast, is now prosecuted along the coast from British Columbia to and below the equator. Similarly, the pilchard (sardine) fishery was extended from California waters north to British Columbia.

The Pacific cod fishery off North America began in about 1864, when a vessel from San Francisco fished for cod in Bering Sea. This fishery is still exploited by United States vessels. In recent years operations have centered around the Shumagin Islands and along the north coast of the Alaska Peninsula.

Commercial fisheries were developed in the interior waters of the continent as population moved westward. They are now pros-

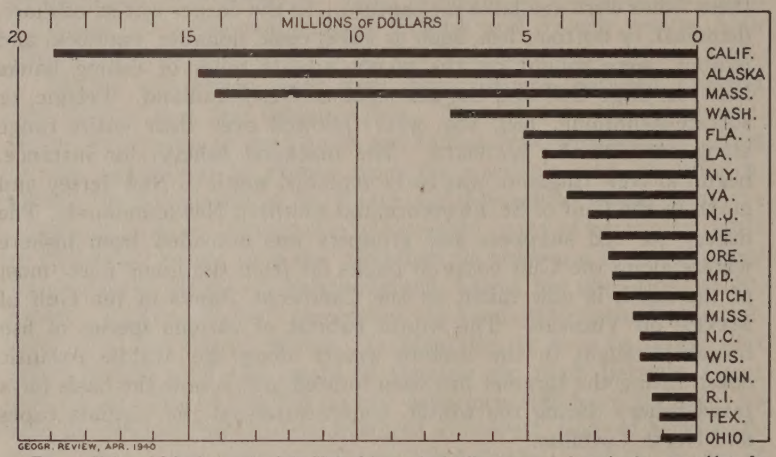

FIG. 1—Value of fisheries catch of the United States by leading states and territories, 1937 (data for 1931 and 1937 are combined for La., Miss., Wis., Tex., and Ohio). The figures for California and Alaska include $520,000 worth of whale products.

ecuted in the Great Lakes, the Mississippi River and its tributaries, and other interior lakes and streams. The yield of these fisheries is not large in comparison with that of the sea fisheries; nevertheless, they contribute materially to the food supply of the Middle West, and a large part of the catch is also marketed in the East.

ECONOMIC IMPORTANCE OF THE FISHERIES[2]

The fisheries of the United States annually yield nearly 4.5 billion pounds of protein food and products of use in the arts and industries. The harvest comprises some 160 varieties or species, 12 of which make up 80 per cent of the total volume—salmon, pilchard, haddock, sea herring, cod, tuna and tunalike fishes, shrimp, oysters, crabs, flounder, mackerel, and halibut.

When ready for market as processed or manufactured products, the fishery harvest of the United States has a value of about $250,000,000 a year in the hands of wholesalers and processors: canned products, $105,000,000; whole frozen fish, $9,000,000; cured fish,

[2] Much of the statistical material contained in this section is drawn from "Fishery Industries of the United States, 1938," by R. H. Fiedler, U. S. Bureau of Fisheries, Washington (in press).

$16,000,000; fresh and frozen packaged fish, $27,000,000; whole fresh fish, $57,000,000; and by-products, $36,000,000.

The commercial fisheries and fishery industries provide employment to more than 220,000 persons; of these, about 130,000 are fishermen, and the rest are employed in the manufacturing, wholesale, and other shore fishery industries. In addition, about 300,000 persons are engaged in allied industries—growing agricultural foods used on

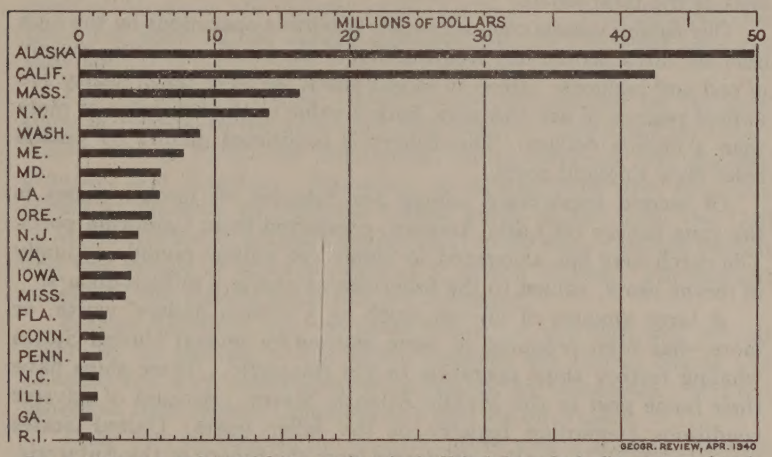

FIG. 2—Value of manufactured fishery products in the United States by leading states and territories, 1937 (data for 1931 and 1937 are combined for La., Iowa, Miss., Penna., Ill.). The figures do not include the value of fresh and frozen unpackaged fish.

fishing ventures or manufacturing products or equipment used by the fisheries (boats, ship chandlery, rope, gear, piling, paper, tin cans, barrels, boxes, and ice). About one in every 250 people in the country is directly or indirectly interested in our fisheries.

In sum, it is conservatively estimated that our fishery industries represent, in all their ramifications, enterprises worth about a billion dollars annually to the industrial structure of the nation. Our fishery resources in their present state of development contribute at least 13 to 14 pounds of edible products a year for every person in the country. Our fisheries are also important in regard to defense; for the 130,000 fishermen engaged in them form a group about equal in size to that of the officers and men in the United States Navy, and our motorized fishing fleet, numbering about 38,000 vessels and boats, constitutes a second line of naval defense. This fleet is capable of forming an effective cordon along our entire coast line.

UNITED STATES FISHING OFF FOREIGN COASTS

As more efficient craft and gear have been developed, there has been a tendency for our fishermen to take more and more of our

(Pages 206 and 207 formerly occupied by the map now on front cover.)

aquatic harvest—as much as 50 per cent—from the high seas, not only off our own coasts, but also off the coasts of neighboring countries.

According to figures of the Bureau of Fisheries, the catch by United States craft and gear on the high seas off foreign countries amounts to about 375 million pounds annually, valued to the fishermen at nearly 15 million dollars. Although this catch is somewhat less than 10 per cent of our entire fishery harvest, its value is about 15 per cent of the total value.

Our fishing vessels conduct rather extensive operations on the high seas off Nova Scotia and Newfoundland, the catch consisting mainly of cod and haddock. Here, in recent years, we have taken nearly 170 million pounds of fish annually, with a value to the fishermen of more than 4 million dollars. This fishery is conducted mainly by vessels from New England ports.

Of second importance among our fisheries off foreign coasts is the tuna fishery off Latin America, conducted from California ports. The catch here has amounted to about 120 million pounds annually in recent years, valued to the fishermen at nearly 6 million dollars.

A large amount of oil—as much as 3 million dollars' worth, or more—has been produced in some seasons by several United States whaling factory ships operating in the Antarctic. These ships have their home port in the Middle Atlantic States. Because of adverse conditions (regarding registry of the killer boats) United States enterprise has practically withdrawn from the fishery in the Antarctic.

In addition, salmon and halibut are taken by Alaskan and Pacific-coast fishing vessels on the high seas off British Columbia, and red snappers and groupers are taken by Gulf fishermen on the Campeche Banks.

More than one-fourth of the annual catch taken by New England fishermen is taken off Canada and Newfoundland. On the Pacific coast 7 per cent of the total catch is taken off British Columbia and Latin America. Fisheries off other foreign coasts are not so important as a whole, though figures are relatively high for certain species; for example, more than 50 per cent of the catch of red snappers landed at South Atlantic and Gulf ports was taken on the offshore banks in the Gulf of Mexico.

Foreign Fishing off United States Coasts

In recent years there have been some fishing activities by foreign vessels off United States territory. Since 1930 Japanese fishing vessels and factory ships have operated in the vicinity of Bristol Bay, Alaska.[3] Operations apparently have been confined in the main to

[3] On this question see H. E. Gregory and Kathleen Barnes: North Pacific Fisheries, *Studies of the Pacific No. 3*, Amer. Council, Inst. of Pacific Relations, San Francisco, New York, Honolulu, 1939 (reviewed in *Geogr. Rev.*, Vol. 30, 1940, pp. 167–168).

the capture of crabs, which are canned aboard the factory ships. In some years the pack has amounted in the aggregate to more than 30,000 cases. From time to time Japanese steam trawlers also operated in this area, catching so-called "trash" fish, which were reduced to meal and oil aboard accompanying factory ships anchored offshore. The output of these fish-reduction ships is not known.

In the summers of 1936 and 1937 Japanese fishing vessels, using long, floating nets, were engaged in the capture of salmon off the coast of Alaska in the vicinity of Bristol Bay. It is understood that these fish were canned aboard Japanese floating canneries anchored near by.

Fishing schooners from Cuba operate sporadically off the west coast of Florida, in the area from Fort Myers to Panama City (Fla.). These vessels, which use hand lines, are in search of red snapper, grouper, and kingfish. According to figures from the American consul at Habana, in 1936 the Cuban catch of fish from the Gulf of Mexico landed at Habana amounted to more than 7 million pounds and was valued at three-quarters of a million dollars. The amount caught off the Florida coast was not indicated.

Foreign nationals may do some fishing on the high seas off our coasts in the vicinity of the border between the United States and Canada; but such operations are probably not extensive. Halibut fishermen from British Columbia also operate off Alaska.

There are, of course, the United States and Canadian fisheries in four of the Great Lakes and the Lake of the Woods; but here the fishermen conduct their operations in the part of the lake within their own country.

Mechanization: Otter-Trawl Fishery

Throughout the greater part of the history of our fisheries the aquatic harvest found ready domestic and foreign markets. However, as the vast, fertile farming regions of the Middle West were developed in the nineteenth century and intensive farming increased in all parts of the country, an enormous quantity of inexpensive land foods was placed on the domestic markets in competition with sea foods. Moreover, with the recent breakdown in foreign trade our fishery industry lost a large part of its world market. As a consequence, competition between the fishery and agricultural industries became keener, and the struggle for a share of the domestic consumer's food dollar was intensified.

The fishery industry met this competition by developing, among other devices, "mass production" methods in the capture of fish both on the high seas and in the inshore waters. The chief factor in the change was the introduction of mechanized gear to replace expen-

sive hand-fishing methods. The otter trawl, for example, a highly effective piece of fishing gear for use on the high seas, was introduced into the New England bank fisheries for the capture of cod, haddock, hake, and other bottom fish formerly caught by hand trawls and lines. This device consists of a bag-shaped net, which is drawn over the ocean floor behind a vessel and envelops the fish as it moves forward. By its use a smaller number of men can catch a larger quantity of fish in a shorter length of time; hence the harvest can be landed at a price more equally competitive with that of land foods.

The first vessel equipped for otter trawling in the United States was introduced into the New England fisheries in 1905. By 1938 the number here had increased to 250. In that year these vessels landed nearly 320 million pounds of fish at the principal New England ports of Boston and Gloucester, Mass., and Portland, Me.—80 per cent of the total catch landed at these three ports.

With the increase in the number of otter-trawl vessels in the New England fisheries has gone a decline in the importance of the less productive hand-trawl and line vessels. In 1938 these vessels landed only about 42 million pounds; ten years earlier they had landed almost double this quantity.

Concomitantly there has been a relative reduction in the number of individual vessel owners and a concentration of craft in the hands of corporations; for otter-trawl vessels, especially those of sufficient size to conduct large-scale operations on the distant banks, are too expensive for most fishermen to finance.[4]

Competition from the more efficient otter trawlers has combined with other adverse economic conditions to reduce the income of many New England fishermen. The situation is especially acute at remote ports along the coast of Maine, where the small catches cannot compete with the huge otter-trawl catches concentrated in the central markets at Boston, Gloucester, and Portland. Some rehabilitation schemes have been tried. The fishermen have been encouraged to form fishery production and marketing coöperatives,[5] a plan that has not had conspicuous success, mainly because of the need of educational work in the principles of coöperation and in business practices. Another plan, operative in Maine, seeks to develop inshore shellfisheries for fishermen unable to make a living from the bank fisheries. Attention is being given to restoring the lobster fishery to its former prominence in this state both by protective measures to further natural increase in the lobster population and by artificial propagation. Steps are also being taken to revive

[4] The change in the type of ownership fulfills a prediction made about twenty-five years ago by investigators of the Bureau of Fisheries regarding the then recently inaugurated New England otter-trawl fishery (A. B. Alexander, H. F. Moore, and W. C. Kendall: Otter-Trawl Fishery, *U. S. Bur. of Fisheries Doc. No. 816*, 1915).

[5] Authorized by *Public No. 464, 73rd Congr., 2nd Sess.*, approved June 25, 1934.

the oyster fishery, now practically extinct in Maine. Before the arrival of white settlers this fishery must have been productive, to judge from the huge mounds of oyster shells, the kitchen middens, left in various parts of the state by the Indians. One such mound on the Damariscotta River is said to contain some seven million bushels of shells.

Attention is also being given in Maine to developing fisheries for sea mussels and periwinkles, large beds of which occur in the waters of this state. There is only a small market for them here, but they are prized as food in various European countries. France alone consumes some 400 million pounds of sea mussels annually and the Netherlands more than 65 million pounds; and the fish market in Antwerp has 16 stalls fitted exclusively for the sale of sea mussels. In recent years the United States Bureau of Fisheries has been carrying on experiments in canning this product, with promising results.

It seems probable, therefore, that as the engines for capturing fish on the offshore banks become more and more mechanized and under corporate control, it will become necessary to develop and extend the inshore shellfisheries.

Factory Ships

The capture of fish on the high seas has also been greatly encouraged by use of the modern highly mechanized factory, or mother, ship, just as the early counterpart of this craft, to which reference has already been made, aided in the development of fisheries far from the Old World ports. These modern ships with their auxiliary catcher boats form highly mobile and versatile units. They are able to prosecute a fishery in almost any sea on the globe, following the schools or runs of fish for thousands of miles throughout their entire range. Almost every type of fish processing is now done aboard these ships while at sea. They are stanchly built to withstand stormy weather and rough seas and range in size from fishing vessels of less than 100 net tons with self-contained processing equipment to mother ships with a displacement of 43,000 tons. Some of the larger carry a crew of 300 men, have a cruising range of as much as 12,000 miles, and can be absent from port for 6 months. When on the high seas they are generally beyond the jurisdiction of any particular nation and thus can operate in a more or less laissez faire manner. Exceptions are the factory ships engaged in the whale fishery:[6] they must abide by the conservation regulations set up under the International Whaling Convention.

Factory ships are now operated in most of the great fisheries of the world. They are prominent in the whale fishery of the Antarctic,

[6] For examples see Gunnar Isachsen: Modern Norwegian Whaling in the Antarctic, *Geogr. Rev.*, Vol. 19, 1929. pp. 387–403.

where they are being utilized to render oil and in some cases to manufacture meal from the whale carcass. They are used also in the salmon and crab fisheries of the Pacific, for canning, and in the tuna fishery, for freezing. Until recently they were utilized in the pilchard fishery off the Pacific Coast States, to manufacture meal and oil. Recent state laws, however, have stopped this, and now most of the pilchard factory ships operate at piers of land stations. One former pilchard factory ship is now operating in the herring fishery off Newfoundland. From time to time fish-freezing ships have operated in the North Atlantic, and during the past several years American and Japanese shrimp-freezing ships have operated off the Pacific Coast of Mexico. A recent report from Sydney, Australia, indicates that a fishery firm there is importing a trawler with equipment for quick-freezing fish at sea.

These ships have permitted a rapid exploitation of fishery resources; but the effect of unrestricted operation on conservation of the world's fish supply is questionable. Moreover, their activities have made local fishery problems international problems.

Biological Aspects

In general, the fisheries of North America are now fairly well charted and are being prosecuted with reasonable intensity by countries of this continent. In some places depletion has been evident—in the salmon and shad fisheries in the rivers, for example, and in the lobster fisheries in the bays and inlets of the Atlantic coast. Efforts are now being made to restore the Atlantic salmon fishery, but it will be many years before there are any appreciable results. Efforts are also being made to tighten state regulations governing the capture of shad and lobsters.

The halibut fishery of the Pacific is depleted not only where it originated but also on the more distant banks. This fishery is now being replenished under the guidance of the International Fisheries Commission between the United States and Canada.

The salmon fisheries in some Pacific coast rivers are also depleted, though in general these fisheries are maintained at a high level of productivity as a result of protective measures promulgated by the federal and state governments and by Canada.

In the main, the extension of various sea fisheries has resulted in an increase in total annual yield that has been fairly well maintained for a number of years. Now, however, the maximum yield of many American fisheries seems to have been reached: from now on annual production may decrease. Some fisheries might decline to an uneconomic point if they should be prosecuted too intensively, but increased public interest in conservation is likely to prevent this. Some might stand greater exploitation—the Atlantic and Alaskan

GENERAL HABITAT OF IMPORTANT NORTH AMERICAN FISH AND SHELLFISH, GENERAL SPAWNING RANGE, AND CONSERVATION MEASURES BY THE UNITED STATES

(About 90 per cent of the annual fishery yield by United States enterprise is based on these species)

FISHERY	GENERAL HABITAT AND WHERE CAPTURED	GENERAL RANGE OF SPAWNING	CONSERVATION EFFORTS
ANADROMOUS SPECIES			
Salmon, Pacific Coast . .	Inshore along coast; in bays; near mouths of rivers; in some large rivers.	Rivers, streams, and lakes. Eggs demersal.	Regulations of federal govt. in Alaska and state agencies on Pacific Coast; International Pacific Salmon Fisheries Commission of the U. S. and Canada. Constant biological study by federal and state govts. State fish hatcheries.
Shad, Atlantic Coast . .	"	Rivers. Eggs demersal.	Regulations of various states. Fish hatcheries. Biological study by state and federal agencies.
PELAGIC SPECIES			
Sea herring, Alaska . . .	Along shore over continental shelf.	Along shore over continental shelf. Eggs demersal.	Regulations and biological study by federal govt.
Sea herring, New England	"	"	State regulations.
Mackerel, Pacific	Along shore.	Along shore. Eggs pelagic.	Biological study by state of California.
Mackerel, Atlantic Coast	Along shore over continental shelf.	Off coast over continental shelf. Eggs pelagic.	Biological study by federal govt. Federal mackerel hatchery in New England.
Menhaden, Atlantic Coast	"	Along shore over continental shelf. Eggs pelagic.	Regulation in various states.
Pilchard, Pacific	Along shore, largely over continental shelf.	Mainly along southern California coast, some to 100 miles offshore. Eggs pelagic.	Regulation by Pacific Coast states. Biological study by federal and state govts.
Swordfish, Atlantic Coast	Along outer edge of continental shelf.	Possibly in warmer parts of Atlantic, 20° to 30° N.	Biological study by federal govt., limited to migrations.
Tuna and like fishes, California and southward .	Along coast in open water.	Not definitely known.	Biological study by state.
Tuna and like fishes, New England	"	"	Biological study by federal govt., limited to migrations.
DEMERSAL SPECIES			
Cod, North Atlantic . .	Continental shelf and slope to 250 fm.	Inshore and open waters 20–30 fm. Eggs pelagic.	Biological study by federal govt. Savings trawl adopted to reduce capture of immature fish. Federal govt. cod hatchery and spawn salvages.
Cod, North Pacific . . .	Continental shelf, 20–50 fm.	Not known definitely, probably inshore and open water 10–30 fm.	—
Haddock, New England .	Continental shelf, 5–100 fm. (mostly 25–60 fm.).	Continental shelf, 15–70 fm. Eggs pelagic.	Biological study by federal govt. Savings trawl adopted. Federal haddock hatchery.
Hakes, New England . .	Continental shelf and slope, 10–500 fm.	Continental shelf somewhat near shore. Eggs pelagic.	Federal hake hatcheries operated from time to time.
Cusk, New England . .	Continental shelf, 10–100 fm., rarely to 300 fm.	Continental shelf in shallow water and to 75 fm. Eggs pelagic.	—
Pollock, New England .	Continental shelf from coast to 75 fm.	Continental shelf, 25–50 fm. Eggs pelagic.	Federal pollock hatchery and spawn taking.
Rosefish, New England .	Continental shelf, 20–90 fm.	On 50-fathom contour of continental shelf. Fish viviparous. Eggs pelagic.	New commercial fishery, begun about 1933. Biological study by federal govt. started.
Flounders, Atlantic Coast	Continental shelf from shore to 70 fm.	Continental shelf. Eggs pelagic, except of winter flounder, which are demersal.	Federal flounder hatchery. Biological study by federal govt.
Halibut, New England .	Continental shelf, 30–100 fm., occasionally to 350 fm.	Continental shelf and slope, from shallow water to possibly 500 fm. Larvae pelagic.	—
Halibut, Pacific Coast . .	Continental shelf to 100 fm. (average, 50 fm.).	Continental shelf and slope over 150 to 250 fm. Eggs occur at intermediate depths.	Regulation and biological study by International Fisheries Commission, U. S. and Canada.
Redsnapper, G. of Mexico	Continental shelf, 20–100 fm. (average, 45 fm.).	Nothing known.	—
Groupers, Gulf of Mexico	Continental shelf to 100 fm. (average, 30 fm.).	"	—
LITTORAL SPECIES			
Croaker, Atlantic Coast .	Along shore.	Open water along shore.	Regulation in some states. Biological study by federal govt.
Scup, Atlantic Coast . .	Along shore in summer; winter offshore, 20–50 fm.	Within few miles of shore. Eggs pelagic.	Littoral fishery regulated in some states. Biological study by federal govt.
Sea bass, Atlantic Coast .	Along shore in summer; summer and winter on shelf, 20–50 fm.	"	"
Squeteague, weakfish, sea trout, Atlantic Coast .	Along shore. A few offshore in winter 20–50 fm.	Open water near shore. Eggs pelagic.	Regulation in several states. Biological study by federal govt.
Crabs, Atlantic Coast . .	Along shore.	Along shore. Eggs carried on female until hatched.	Regulation in various states. Biological study by federal and state govts.
Lobsters, Atlantic Coast .	"	"	"
Shrimp, Atlantic and Gulf Coasts	"	Open water along the coast over the continental shelf. Eggs demersal.	"
Oysters, Atlantic, Pacific, and Gulf Coasts . . .	"	Along shore. Larvae free-swimming; spat attaches to objects at bottom.	"

Source:—Various publications of the United States Bureau of Fisheries and state fishery agencies.

cod fisheries, for example. Furthermore, some noncommercial but fairly abundant species might be fished more intensively if a use could be found for them as food or in industry.

As was indicated previously, the littoral and ocean fisheries of North America are conducted in general over the submarine fringe of the continent known as the continental shelf. On the Atlantic seaboard this ranges in width from a few miles to 125 miles or more. It slopes gradually to a depth of about a hundred fathoms and beyond this drops sharply to depths of more than a thousand fathoms. Although the continental slope is characterized by a rugged topography and is incised by great canyons, some of which extend into the shelf, the shelf itself is in general a gently sloping plain. Lieutenant Paul A. Smith[7] says that between Cape Hatteras and the eastern border of Georges Bank the shelf is so flat that, with a few local exceptions, an automobile could probably be driven over any part of its surface. However, in places, as off New England, the surface is more rugged, and cuestalike ridges rise above its general level: these are the so-called "fishing banks."[8]

The existence of the North American fisheries is critically bound to the continental shelf. Here plankton thrive well and provide an abundant source of fish food. Temperature and light are suitable for growth and reproduction. Conditions so favorable are not found in the deeper waters beyond the shelf, where fish for commercial capture are virtually lacking. In general, the commercial species of North American fish are taken in waters within the confines of the continental shelf, the demersal species at depths to 200 fathoms, though mostly in depths less than 100 fathoms. Even if fish did occur in sufficient quantities in the deeper waters beyond the shelf, it would be a costly operation to capture them.

According to our present knowledge, the species of fish found on the North American continental shelf do not migrate overseas—that is to say, in the Atlantic they do not migrate in an easterly direction to the fishing banks off Europe, or in the Pacific in a westerly direction to Asia. Some species, such as the mackerels (Scombridae), seem to have a tendency to migrate in a southerly direction, toward South America.

The pelagic, demersal, and littoral species, in general, feed, grow, reproduce, and migrate within the confines of the shelf; and anadromous species not only feed, grow, and migrate on the shelf but spawn in waters flowing over the continent. Thus, those species of fish occurring on the continental shelf of North America form, for all practical purposes, a North American resource.

[7] Atlantic Submarine Valleys of the United States, *Geogr. Rev.*, Vol. 29, 1939, pp. 648–652; reference on p. 649.

[8] Douglas Johnson: The New England-Acadian Shoreline, New York and London, 1925, pp. 267–282.

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